

## EFFECT OF MOISTURE ON DGEBA EPOXY RESIN SYSTEMS



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### OBJECTIVE

- Influence of hydro/hygrothermal exposure on the behavior of epoxy-amine systems

### MATERIALS & METHODS

SC-11 (A+B)- Cured at 74°C for 2 hrs.

SC-79 (A+B)- Cured at 43°C for 14 hrs, at 121°C for 4 hrs

SC-15 (A+B)- Cured at 43°C for 14 hrs, at 93°C for 30 minutes and 127°C for 90 minutes.

Composite panels – Resins with S2-Glass (24 oz/lyd<sup>2</sup>) using VARTM.

**Absorption:** Water at 71°C in an oven; Environmental Chamber at 87.7°C with 85% relative humidity.

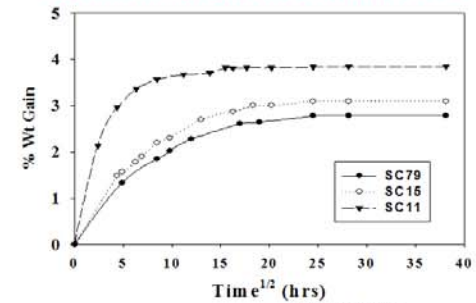


**Desorption:** Saturated samples dried at 50°C in an oven.

**Swelling Experiments:** Dimension changes measured each time during weight experiments.

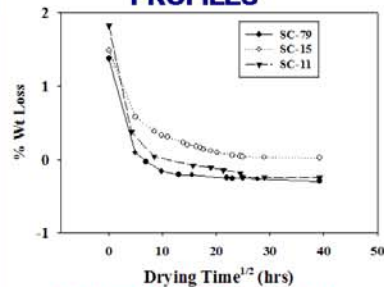
### RESULTS

Transient percent weight gain for resins immersed in water at 71°C



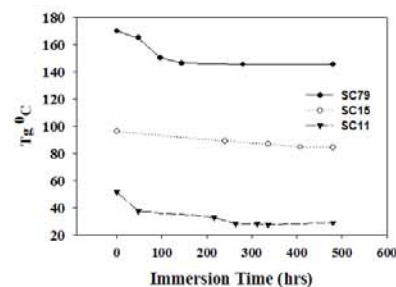
SC11 achieves saturation in less time (~ 225 hrs) compared to SC15 and SC79 which take approximately 900 hours.

### WATER DESORPTION PROFILES



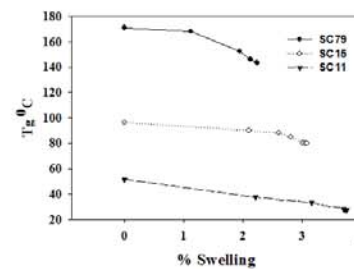
>A net weight loss of ~ 0.25% is measured for both SC11 and SC79 resins.

### T<sub>g</sub> PROFILE WITH WATER IMMERSION TIME



>After 300 hrs the T<sub>g</sub> variation is negligible

### VARIATION OF T<sub>g</sub> WITH PERCENTAGE OF SWELLING



>T<sub>g</sub> decreases with increasing swelling  
>Order of swelling is SC11 > SC15 > SC79

### CONCLUSIONS

- > 300 hrs is the minimum time required for DGEBA epoxy systems to get wet T<sub>g</sub>.
- > Low crosslink system, SC11 absorbs most water. Trend is same in the composite also.
- > Overall water absorption of composites is lower than the neat resins.
- > Water molecules rupture crosslink chains causing decreased T<sub>g</sub>
- > T<sub>g</sub> decreases with increasing swelling.

### ACKNOWLEDGEMENTS

This work is supported by the Tank-Automotive Research, Design, and Engineering Center through the Composite Materials Technology program.